



Gloucestershire

Review of Gloucestershire Wildlife Trust's Badger Vaccination Deployment Trial 2011-2015

November 2015





1 Introduction

The debate around badgers and their role in the spread of Bovine Tuberculosis (bTB) has been one of the most divisive and high profile farming and wildlife issues in the county. Gloucestershire and Somerset were the first two counties selected by the Government to trial the culling of badgers in 2013. Gloucestershire Wildlife Trust (GWT) has opposed the culling of badgers as part of the Government's Bovine TB eradication strategy because we do not believe that the science supports culling as an effective way to control the spread of the disease in cattle. The cull is being rolled out on the premise that culling 70% of badgers over a designated area could result in a 16% reduction in bovine TB¹.

At the same time, GWT recognises the distress that bTB causes farmers in the county - farmers the Trust works with successfully to protect wildlife in the county. With this in mind, GWT embarked upon its badger vaccination programme in 2011 in an attempt to make a positive contribution to trying to tackle the problem of bTB in cattle. The trial was never intended to demonstrate that vaccinating badgers could lead to a reduction of the incidence of bTB in cattle. Rather the aim was to show that vaccinating wild badgers could be done efficiently and in a financially viable way. The science on the efficacy of the vaccine in controlling TB in badgers further prompted the Trust to consider a badger vaccination trial - developing what was then an underused and newly available measure for tackling the disease. As landowners with cattle grazing many of our reserves we wanted to take action to try to prevent bTB breakdowns on our sites and those adjoining them.

Halfway through our vaccination trial, in 2013, the first pilot cull of badgers began. The cull divided opinions, in the county, including among our members, many of whom held strong views on either side of the debate. GWT's focus during the cull was not to get embroiled in the arguments between groups with opposing views, but to press on with our vaccination programme, hoping that our action could help inform the wider issue of the best way to tackle bTB in cattle. In 2013 we started to increase the size of our vaccination programme, extending its reach to work outside of our reserves.

Our position then - as now - was based on the evidence arising from the Randomised Badger Culling Trial (RBCT) carried out between 1998 and 2005 and overseen by the Independent Scientific Group, which concluded that culling badgers could make no meaningful contribution to controlling bTB in cattle. The trial also highlighted the potential risk of the disruption of badger social groups by culling, resulting in the

dispersal of infected badgers which could then go on to further infect other badgers and cattle - an effect known as perturbation.

According to research² badger vaccination is capable of reducing the incidence of positive tests for bTB in wild badgers by almost 74%. With a sustained period of deployment the beneficial effects of vaccination should accrue over time as the proportion of the population vaccinated increases and animals with pre-existing infection die off naturally.

It has been demonstrated³ that even when cubs in a social group had not been vaccinated, they were significantly less likely to test positive for bTB when more members of their group had been previously vaccinated. When more than a third of the social group had been previously vaccinated, the risk of non-vaccinated cubs testing positive was reduced by 79 per cent, an effect known as 'herd immunity'.

Building on work led by the Trust's former CEO Dr Gordon McGlone of over ten years, Gloucestershire Wildlife Trust was the first non-government organisation to vaccinate badgers against bTB and we have done so for the

past five years. This work has been supported by GWT members who have donated generously to support the programme, and by Stroud District Council, who have supported the extension of the project since 2013. This report documents the results of one of the few five year badger deployment trials to have been completed by an NGO, highlighting the practicalities and costs of carrying out such a programme.

2 Aim of the programme

The aim of our programme was to demonstrate that the vaccination of badgers could be carried out effectively and in a way which was financially viable. At the start of the programme, very little was known about the costs of badger vaccination and even less about how this measure might be deployed by 'lay' vaccinators.

In a policy climate which often dismissed badger vaccination as costly, impractical and ineffective, we wanted to undertake a fully transparent deployment trial from which farmers, landowners and other wildlife groups could learn.



3 Badgers and their ecology

Badgers are nocturnal animals and are rarely seen during the day. When not active, badgers usually lie up in an extensive system of underground tunnels and nesting chambers, known as a sett. Each social group usually has a main sett where the majority of the group live most of the time, but there may be odd holes scattered around the territory that are used occasionally. Badgers can live in very large social groups, but usually numbers around six. These defend an area around their main sett as a territory. Territories may be as small as 30ha or as large as 150ha depending on the terrain. Badgers mark the boundaries of territories by leaving their faeces in collections of shallow pits, which in aggregate are called latrines.

Mating takes place between February and May, with implantation delayed until late winter. Only one female badger in a social group normally breeds, although sometimes two or more may do so. Litters of 2-3 cubs are born around February blind and hairless in the safety of the sett. They usually appear above ground at about eight weeks, and weaning usually takes about 12 weeks. By late summer they are usually feeding independently but can be adversely affected by drought at this time causing starvation.

Badgers are described as opportunistic omnivores but during normal weather conditions their diet consists of up to 60% earthworms, along with a range of other insects, slugs and snails as well as berries. They will take small mammals and birds and their eggs and have been known to eat hedgehogs,

but evidence suggests that these more unusual prey items make up less than 5% of their diet.

In 1988 there were estimated to be around 42,000 social groups of badgers in Britain, and just under 200,000 adult badgers. By 1997 this had risen to just over 50,000 social groups and 310,000 adult badgers. The population is now thought to be stable. Mortality is high, however, with around one-fifth of adults dying each year. Road traffic accidents are a major cause of death.

Badgers were first discovered to carry bTB in 1971. Since this discovery much research has been undertaken to try to understand disease dynamics in badgers. Badgers are now widely considered to represent a wildlife 'reservoir' of the disease.

(from Mammal Society factsheet)

4 Methodology

The Trust decided in 2010 that it would pursue the deployment of Badger BCG on selected nature reserves over a five year period. Reserves were chosen according to the following criteria:

- Evidence of badgers present on site
- Grassland, on site or immediately adjacent, which was grazed by cattle, and
- Recent presence of bTB in the neighbouring area.

4.1 Pioneering the trial

Six reserves were chosen in the Stroud area - Daneway Banks (17ha), Swifts Hill (10 ha), Frith Wood (24 ha), Siccaridge Wood (27 ha), Snows Farm (21 ha), and Strawberry Banks (5 ha). Surveys of these reserves revealed that there was one badger sett at each. A seventh reserve - Greystones Farm (66 ha) at Bourton-on-the-Water - was added to the suite of sites and surveys here revealed that there were 5 badger setts across the Farm. Collectively these reserves demonstrated a wide range of habitat types, terrain and use by badgers.

A member of staff - our first vaccinator who would be deployed in the Stroud area - received training from the Food and Environment Research Agency (FERA) in late 2010. Planning for the first

year of vaccination began in early 2011 and involved:

- Sourcing and purchasing the necessary equipment and supplies
- Obtaining the co-operation of a local vet to ensure appropriate supply and storage of the Badger BCG vaccine
- Detailed site surveys to determine the best location for live traps
- Applying for Certificates of Competence for our vaccinator
- Arranging for the supply of vaccine for the planned programme
- Agreeing a timetable for vaccination and complying with FERA's audit requirements
- Obtaining a licence from Natural England to permit vaccination

A second staff member was trained later in 2011 and was deployed at Greystones Farm. Currently five GWT staff are trained as vaccinators.

4.2 2013 extension to the trial

In 2013 and 2014 additional non-Trust sites were added to the programme. In the Stroud Valleys four farms became part of the trial. These not only extended the area of land around our reserves which were being targeted, they also started to fill the gap between our trial area and that being covered by Defra as part of their five-year Badger Vaccine

Deployment Project in Gloucestershire which was focussed on land in the Stroud/Severn Vale area.

Near to our Greystones Farm reserve in Bourton-on-the-Water a tenanted farm holding (covering parts of a number of farms) was added to the trial in 2014. This holding was grazed by the same cattle as those grazing the reserve and cattle were moved between the different parcels of land at different times of the year depending on the grazing requirements. The decision was taken to include all this land in the programme to ensure that vaccination was carried at all locations grazed by the same herd.



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4.3 How to vaccinate a badger

Step 1 - survey the site, identify location of setts and assess best places to position traps, number and record, dig traps in to hide floor. The local knowledge of Trust staff proved invaluable with this stage of the process.

Step 2 - begin a 7-day pre-baiting of traps with peanuts to familiarise badgers with traps. Peanuts were placed under a rock where only badgers could retrieve them. Each day they were moved closer to the trap until on the day of trapping the peanuts and rock are at the back of the cage and the action of the badger lifting the rock triggers the trap.

Step 3 - on day eight set the traps after 3.00 pm. Return between 4.00 am and 8.00 am the following morning. Traps are only set if weather conditions are forecast as favourable. The welfare of trapped badgers was of paramount importance throughout the trial.

Step 4 - count the number of badgers trapped and ensure that they are unharmed; prepare vaccine on site; vaccinate all trapped badgers, cut fur and spray with paint to indicate they have been vaccinated. Keep a detailed log of all vaccination activity.

Step 5 - release badgers and reset and bait traps after 3.00 pm for day 2.

Step 6 - return following morning and repeat activity above. Any recaptured badgers are recorded and released.

Step 7 - Traps removed, cleaned, disinfected and either relocated or returned to store



Step 1



Step 1



Step 1



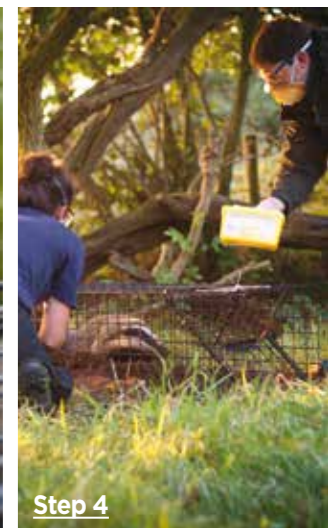
Step 2



Step 4



Step 4



Step 4



Step 5



Step 7

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TABLE 1 Time spent (hours) vaccinating badgers 2011-15

	2011	2012	2013	2014	2015
Stroud Area Sites (Difficult access)	85.5 (6 sites)	83.5 (6 sites)	80.5 (6 sites)	117.5 (10 sites)	104.5 (10 sites)
Greystones Farm Sites (Good access)	73.5 (1 site)	66.5 (1 site)	70 (1 site)	101.5 (2 sites)	98 (2 sites)
TOTAL	159	150	150.5	219	202.5

4.4 Time allocation

Vaccinating badgers in the wild is a physically demanding activity requiring the positioning of multiple heavy traps at each sett, often with poor vehicular access. The main time elements are loading and transporting traps, digging in and pre-baiting, vaccinating and finally cleaning and disinfecting traps. During the course of the five year trial, with increasing vaccinator experience, the time spent on these activities reduced year on year until in the final year 202.5 hours in total was spent vaccinating 38 badgers on 12 sites. See Table 1.

The Stroud area reserves and farms are situated on the Cotswold scarp and most present challenging terrain for delivering a vaccination programme. However the badger setts here were relatively small and fewer traps were required. These sites are also close to Trust HQ and travel distances were short as a result. At Greystones Farm, while the terrain is flat, there are five large setts spread across the farm and up to three times the number of traps were required compared to the Stroud sites to cover the site adequately. In addition the farm is in the north Cotswolds, a greater distance from Trust HQ and consequently travel distances were greater.

5 Badgers vaccinated during the vaccination trial

Over the course of the five year programme a total of 203 badgers were vaccinated either on selected Trust nature reserves or on farms adjacent to those reserves. The numbers and locations are shown in Table 2. Because each badger was sprayed marked after vaccination we know that no badger was vaccinated twice in the same year. We cannot be sure, however, that the same badger was not vaccinated on more than one occasion during the five year programme.

Unfortunately there is no way of estimating what percentage of badgers in each sett we have vaccinated as part of our programme. The relatively low numbers of badgers involved and few recaptures makes a statistical calculation impossible. We do know, however, that the average number of badgers usually present in a sett is about 6 – but up to 20 for larger well established setts, but 2 or 3 for temporary or outlying setts. Of the setts we have used for our study, five are considered to be main setts and the remainder outliers. The average number of badgers vaccinated from the main setts at each reserve over the period of the trial ranged from 4.2 to 5.7. For the

TABLE 2 Total number of badgers vaccinated during the five year trial

	2011	2012	2013	2014	2015	Total
Stroud Area Reserves (average number of traps deployed)						
Snows Farm (11)	6	5	5	3	4	23
Frith Wood (7)	4	3	4	4	4	19
Siccaridge Wood (10)	6	5	5	4	3	23
Daneway Banks (3)	0	0	2	1	0	3
Strawberry Banks (3)	1	1	2	1	0	5
Swifts Hill (2)	4	2	2	2	1	11
TOTAL	21	16	20	15	12	84
Stroud Area Farms						
Stroud Slad Farm (9)	-	-	7	5	5	17
Dunkitehill Wood (4)	-	-	-	2	1	3
Bonds Grove (5)	-	-	-	3	2	5
Redding Wood (2)	-	-	-	1	2	3
TOTAL	-	-	7	11	10	28
Greystones Farm						
Farm Yard	n/a	2	4	3	1	10
Green Lane	9	6	2	3	4	24
Ramparts	2	2	3	1	1	9
Hornworks	3	4	2	2	4	15
Northern Boundary	3	5	4	5	4	21
Remote Traps	0	4	2	n/a	1	7
TOTAL (27)	17	23	17	14	15	86
Greystones Farm Extension holding (3)	-	-	-	4	1	5
TOTAL	38	39	44	44	38	203

outlying setts it ranged from 0.4 to 1.8. While we have no empirical evidence, from this information we are confident that we vaccinated on average at least 60% of the badgers resident in each of the setts used in the programme. This is encouraging given that the herd immunity effect can become apparent when only 33% of a social group is vaccinated.

6 Cost of GWT's vaccination programme

The cost of implementing the Trust's five year vaccination programme is given in Table 3. Overall costs have decreased year on year following initial capital outlay and training costs, starting with a total cost of £14,068 in 2011 and finishing with a total cost of £7,703 in 2015.

The cost of staff time was high at the start of the programme because of time spent on training and other preparatory work. As the programme progressed there was an associated reduction in staff time per site year on year as

vaccinators gained more experience and became familiar with the routine. The cost of the vaccine and certificates of competence (which now no longer have to be renewed annually) varied considerably during the five years of the trial.

7 Lessons learnt

So what have we learnt from our five year trial?

We know that we can implement on an annual basis a well-honed and effective procedure for trapping and vaccinating badgers at a cost which is financially viable. From a first year cost of just over £14,000 (which included capital outlay) for seven sites and 38 badgers we have reduced our final year deployment cost to just over £7,700 for 12 sites and 38 badgers.

We improved our implementation year on year reducing both the staff time spent on deployment and the unit cost involved. Knowledge of badger ecology together with the experience and skills of the Trust staff involved has undoubtedly helped us to develop and implement this streamlined procedure. The Trust had limited staff capacity which it was able to train and deploy on the vaccination programme. All staff involved carried out their normal day to day duties in addition to the vaccination work.

Vaccination across large areas of land or adjoining land units reduces delivery costs if equipment and resources can be shared, and is expected to provide greater disease control benefits within badger populations. It is easy to envisage that with dedicated staff working full time during the vaccination period that a considerably larger area could be covered by a vaccination programme at a similar unit cost (£202.71 per badger) as that demonstrated here. The only other method currently available for

controlling TB in the badger population – ie culling – cost in 2014 (according to Government figures) £7262.21 per badger⁴.

Elsewhere badger vaccination programmes are demonstrating successes in trapping and vaccinating significant numbers of badgers. In March 2012 the Welsh Government announced a new Strategic Framework for Bovine TB eradication which saw the cancellation of the proposed cull and the start of a replacement badger vaccination programme. Figures from the 2014 season show that 1,316 badgers were trapped and vaccinated over an area of 260 km², at a cost of £929,540⁵. This equates to £706 per badger. To date over 5,000 badgers have been vaccinated in Wales.

In Cornwall, the West Cornwall Badger Vaccination Project is Defra-funded and is both a community vaccination project using volunteers and a research project, co-ordinated by the Zoological Society for London (ZSL). Badgers are being vaccinated across successive parishes year on year, across the Penwith peninsula. Parishes are used for easy comparison with TB breakdown figures. As well as vaccination, badgers in smaller target areas are being tested for TB to assess the proportion of badgers infected. Over the course of the five-year project ZSL's research will determine whether badger vaccination can effectively reduce bTB infection in Penwith's badger population, and whether this in turn can help control the spread of infection in cattle. This is a well thought out project designed to deliver just the data required to demonstrate the efficacy of badger vaccination.

The Government is still to publish the results of its recently-completed five-year Badger Vaccination Deployment Project – a trial which targeted a large area of farmland northwest of Stroud.

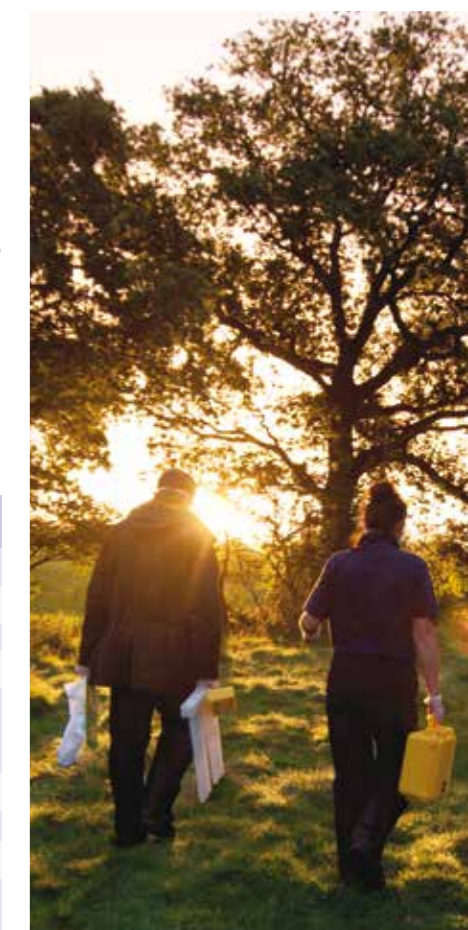
TABLE 3 The costs of the five year vaccination programme

	2011	2012	2013	2014	2015
Training and equipment	8432	5241	552	1037	513
Delivery costs	140	1425	1505	1678	1382
Staff time	5496	7423	6593	6146	5808
Total	14068	14089	8650	8861	7703
Number of reserves/sites	7	7	7	12	12
Cost per reserve (or site) per year	2010	2013	1236	738	642
Number of badgers vaccinated	38	39	44	44	38
Cost per badger vaccinated	370.21	361.26	196.59	201.39	202.71

The total cost of the five year programme was £53,371

The BVDP had the same aim as our pilot project, i.e. to assess the practicalities of delivering a badger vaccination programme on free living badgers. This project had the potential benefits of vaccinating badgers over a much larger area of land than our pilot, but the challenge of signing up sufficient farmers to participate in the scheme. The project has provided a valuable insight long-term into the practicality of injectable and oral badger vaccination and results of the project are eagerly awaited.

A vaccine for use on cattle still appears to be some way off. Vaccination of cattle against bTB could reduce the prevalence, incidence and spread of the disease in the cattle population, reducing the number, duration and severity of breakdowns. The ability to provide these benefits would be dependent on the effectiveness of a vaccination programme in terms of the vaccine used, the way in which it was deployed, and on the performance of a compatible diagnostic test. At the moment there is no test available which would allow a distinction to be made between vaccinated and infected cattle and until such a test is available vaccinating cattle would be contrary to European legislation.



8 Recommendations and next steps

'Underused tool in the toolbox' GWT believes that badger vaccination shows some promising signs of being a practical and cost effective way to control TB in the badger population. It remains, in the view of the Trust, an underused measure in the battle against the disease in cattle, although more research is needed to show the link between badger vaccination and its impact on the disease in cattle.

More research required demonstrating the link with bTB The Government's own Badger Vaccination Deployment Project described above has the potential to be developed to look at whether the five year trial has had any impact on the incidence of bTB breakdowns in the catchment areas, but to date no research to explore this link has been commissioned by Defra. Research in this area could provide vital data on whether vaccinating badgers translates into a reduction of the incidence of bTB in cattle.

References

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Work together with farmers on the solutions The lack of Government backing for badger vaccination and the lack of investment in research on the link between vaccinating badgers and control of bTB means that the farming community have not always had the knowledge or confidence in badger vaccination. However, multi-agency local TB groups, such as the one set up in Gloucestershire by the National Farmers Union and the Animal and Plant Health Agency (which also includes Gloucestershire farmers, vets and GWT), are a recommended way to encourage a broader and evidence based approach to tackling bTB.

Promotion of vaccination should not be restricted to the 'edge' Current Defra policy recommends that badger vaccination programmes focus around the geographical edges of areas of high prevalence of bTB. GWT believes that badger vaccination could be a useful tool used more widely, including in areas of high prevalence of bTB. In areas of high incidence where the wildlife reservoir is not responsible for transmission to cattle, badger vaccination could be a useful tool.

9 Next steps for GWT

Now that the five year trial on our nature reserves is over, the Trust will continue to vaccinate on those nature reserves from the pilot – Snows Farm and Greystones Farm – where cattle and badgers co-exist. We will continue for two more years to ensure that immunity is achieved and maintained in the badger population.

We will also consider vaccination on other reserves in the county where both cattle and badgers are present. Thereafter we will review the situation – hopefully informed by further evidence from the Cornish and Welsh deployment of badger vaccination.

Our ambition was to demonstrate that small scale lay vaccination was viable, not to roll out a vaccination service through the Trust. However we will offer badger vaccination services through our ecological consultancy, Wild Service, to support farmers and landowners who are keen to explore this option.

Finally – having demonstrated that it can be done – we will continue to promote badger vaccination and call for more research on its efficacy.



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